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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/718,865	11/21/2003	Simon Chooi	CS99-332B	1468

7590 04/15/2005  
George O. Saile  
28 Davis Avenue  
Poughkeepsie, NY 12603

EXAMINER

VU, HUNG K

ART UNIT PAPER NUMBER

2811

DATE MAILED: 04/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

FL

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/718,865	CHOOI ET AL.	
	Examiner	Art Unit	
	Hung Vu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 February 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 21-30 and 32-41 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 32-41 is/are allowed.
- 6) ☒ Claim(s) 21-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Objections*

1. Claim 26 is objected to because of the following informalities: In claim 26, line 2, "stack dielectric layers" should be changed to "stack dielectric layer" for clarity. Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 21 – 30 are rejected under 35 U.S.C. 102(e) as being anticipated by Edelstein et al. (PN 6,181,012).

Edelstein et al. discloses, as shown in Figures 2-4D, an interconnect structure comprising:

- a semiconductor structure having a first dielectric layer (100) and a lower interconnect (46) in the first dielectric layer;
- a passivation layer (101) over the first dielectric layer and the lower interconnect;
- a stack dielectric layer (54,70) over the passivation layer;
- an upper interconnect (60) through the stack dielectric layer and the passivation layer contacting the lower interconnect and having sidewalls consisting of an interface layer (76)

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comprised of copper sulfide [Col. 6, lines 24-50, Col. 8, lines 25-39]. Note that the examiner considers the copper alloy comprising copper and sulfur as a copper sulfide.

Regarding claim 22, Edelstein et al. discloses the stack dielectric layer consists of one dielectric layer (54).

Regarding claim 23, Edelstein et al. discloses the stack dielectric layer is comprised of a second dielectric layer (54) and a third dielectric layer (54).

Regarding claim 24, Edelstein et al. discloses a metal (Cu) forms the upper interconnect [Col. 6, line 51-60].

Regarding claim 25, Edelstein et al. discloses there is an etch stop layer (70) between the second and third dielectric layers.

Regarding claim 26, Edelstein et al. discloses a cap layer (101) is on the stack dielectric layer.

Regarding claim 27, Edelstein et al. discloses the lower interconnect is comprised of one or more conductors from a group containing copper, aluminum, aluminum alloy, tungsten, titanium, titanium nitride, tantalum nitride, and tungsten nitride [Col. 6, lines 10-50, Col. 9, lines 28-31].

Regarding claim 28, Edelstein et al. discloses the lower interconnect is copper.

Regarding claim 29, Edelstein et al. discloses the dielectric layers are one of non-porous undoped silicon oxide, non-porous doped silicon oxide, non-porous organic material, and porous organic material (polymeric) [Col. 9, lines 56-58].

Regarding claim 30, Edelstein et al. discloses the passivation layer is one of silicon nitride [Col. 7, lines 48-50].

***Allowable Subject Matter***

3. Claims 32 – 41 are allowed.

4. The following is an examiner's statement of reasons for allowance:

Applicant's claims 32 – 41 are allowable over the references of record because none of these references disclose or can be combined to yield the claimed interconnect structure comprising an upper interconnect having an interface layer comprised of copper sulfide only on sidewalls of the upper interconnect, in combination with the remaining claimed limitations of claim 32.

***Response to Arguments***

5. Applicant's arguments with respect to claim 21 have been considered but are moot in view of the new ground(s) of rejection.

*Conclusion*

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (571) 272-1666. The examiner can normally be reached on Mon-Thurs 6:00-3:30, alternate Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The Central Fax Number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

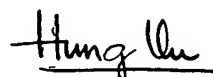
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Vu

April 4, 2005

A handwritten signature in dark ink, appearing to read "Hung Vu", written over a horizontal line.

Hung Vu

Primary Examiner